2001 Triennial Review of Water Quality Standards

Staff Proposal

Tennessee Division of Water Pollution Control

December, 2001

Introduction

Water quality standards are goals for surface waters such as streams, lakes, and wetlands. Each state develops its own standards that must include at a minimum three parts: stream use classifications, general water quality criteria, and an antidegradation policy. Tennessee periodically reviews its water quality standards in order to insure that the most recent science and research has been incorporated into our water quality goals.

Stream use classifications are beneficial public uses that have been assigned to each waterbody in the state. Tennessee currently specifies a set of seven designated uses: fish and aquatic life protection, recreation, domestic water supply, industrial water supply, irrigation, livestock watering and wildlife, and navigation. Some streams or lakes are specifically named in the regulation (Chapter 1200-4-4). However, since it is not possible or desirable to list every stream in the state, the regulation also contains "catch-all" statements that assign a set of uses to streams within each basin that have not been specifically named.

General water quality criteria are descriptions of the level of water quality required to sustain each of the designated uses. Many criteria are numeric while others are narrative. Narrative criteria are verbal descriptions of conditions associated with pollution and are frequently crafted as "free from" statements.

The Antidegradation Policy establishes the circumstances in which degradation can and cannot be allowed in Tennessee waters. The Policy also describes "high quality waters" (Tier II) and authorizes the Tennessee Water Quality Control Board to designate Tier III waters, called Outstanding National Resource Waters (ONRWs). Tennessee currently has seven designated ONRWs: Abrams Creek, Little River, West Prong Little Pigeon River, Little Pigeon River, Obed River, Big South Fork of the Cumberland, and Reelfoot Lake. (The designation of the Obed as an ONRW is conditional and allows the river to revert to Tier II status based on regional water supply factors.)

The combination of a set of designated uses, the criteria assigned to those uses, and the antidegradation status of a specific stream combine to create the water quality standard for that stream. For application of the standards, including water quality assessment and permitting, the most stringent criteria apply.

In Tennessee, promulgation of water quality standards is a responsibility of the Water Quality Control Board. The general makeup of the Board is established by the Water Quality Control Act. It is currently set at ten members with three of the members representing the Departments of Environment and Conservation, Public Health, and Agriculture, respectively. Other members represent conservation interests, agriculture, small business, municipalities, industries, county governments, and the public-at-large.

The Division generally provides technical support to Board members and holds public hearings on behalf of the Board.

Background of the Staff Proposal

The staff proposal is a traditional step in the periodic review of water quality standards. Unlike the steps that will follow, the staff proposal is not an official part of the process for promulgating a regulation. The purpose of the staff proposal is to provide insight to the public, regulated community, and sister agencies concerning the thoughts and priorities of the staff of the Division of Water Pollution Control. Additionally, it provides a preview of the recommendations likely to be made by the Division to the Board.

It is our hope that the staff proposal will stimulate interest into the water quality standards revision process. We will happily discuss any topic related to the staff proposal with anyone.

It is important to note that while the Division is pleased to provide this information, the following issues must be considered:

- The staff proposal is intended to provide general information. Therefore, specific proposed regulation language will not necessarily be suggested at this time. Instead, general information about the rationale for a specific revision will be provided. In some cases, the reviewer of the staff proposal will be referred to other recently published documents for a more thorough rationale and supporting information.

- As the staff proposal is not a part of the regulatory process, we will not respond formally to any comments made. Additionally, reviewers should remember that comments to the staff proposal are not officially a part of the rulemaking process. Thus, interested parties should plan to also comment or attend a public hearing when the draft regulation is published.

  It is not that we are disinterested in comments. We would be happy to respond informally to comments about the staff proposal, if requested. We will also meet with interested parties. In the more formal promulgation process that follows, we must respond whether or not the commenter asks for a response.

- The Division cannot be bound by the contents of the staff proposal. As we receive additional information, we must be free to reconsider our eventual recommendations. We may also suggest new proposed revisions beyond those contained in the staff proposal. Again, reviewers of the staff proposal should also plan on reviewing the more formal draft regulation.

- No public hearings will be held in conjunction with the staff proposal. (As established by state law, hearings will be held in conjunction with the more formal portions of the promulgation process.)

Questions or informal comments about the staff proposal, or requests for meetings, should be directed to:

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General and Specific Issues With the
2001 Triennial Review of Water Quality Standards

Several things normally happen during a triennial review.

- Numeric criteria are updated, based on the results of EPA's most recently published national guidance. Any newly adopted MCLs for drinking water are incorporated into the criteria for protection of domestic water supplies.

- The Antidegradation Policy is updated, if needed. Additional ONRWs may be proposed.

- Coordination takes place with the U. S. Fish and Wildlife Service staff to ensure that water quality standards are protective of species with special status.

- Once a draft regulation has been published, public hearings are held in numerous places across the state. The Board formally responds to comments received during the formal comment period.

- Stream-use classifications are updated as needed. While not officially a stream-use classification, the list of trout streams and naturally reproducing trout streams is also updated.

- As EPA approval is required before new standards can be implemented, Division staff will work very closely with EPA's regional office in Atlanta.

Regional Criteria

In one important way, the 2001 Triennial Review of Water Quality Standards will be significantly different than previous reviews. Up to now, Tennessee's criteria have been generally statewide in coverage and were based primarily on the results of EPA research and guidance. The disadvantage of such an approach is that statewide criteria based on studies undertaken elsewhere do not adequately allow for obvious regional differences in background water quality conditions.

In the 2001 review, the Division will significantly depart from the previous approach. Background data from multiple reference streams throughout Tennessee will be used to propose new regional criteria. Such an approach will be suggested for parameters like dissolved oxygen, pH, nutrients, and biological integrity.

The federal government does not mandate such an approach. The Division's interest in this methodology is simply that the revisions will provide more accurate water quality goals. These more accurate goals will lead to more valid and defensible water quality assessments and more appropriate permitting decisions.

Pathogen Criteria

Of all the pollutants regulated within the General Water Quality Criteria, the linkage between the amount of pathogens in surface waters and direct risk to humans would seem the most obvious. Historical outbreaks of water-borne diseases are well documented in this country. While they have been greatly reduced in recent years, outbreaks are not unheard of even in this age of modern sanitation. Children, seniors, and those with suppressed immune systems are particularly at risk.

With the possible exception of the Antidegradation Policy, the provision within the General Water Quality Criteria that generates the most comments any given year is Tennessee's pathogen criteria. Following are some of the generalized comments we commonly receive:

- That the use of fecal coliform as a primary indicator of pathogens is a significantly flawed approach. Not all strains of fecal coliform bacteria cause disease in humans.

- That background levels of pathogens may be elevated due to natural sources (such as ducks, geese, other birds, deer, pets, etc.), making it difficult for even clean streams to meet standards.

- That the currently blanket classification of all streams for recreational use (full water contact) should be modified to create less stringent criteria for streams where recreational use is unlikely.

- That it is overly protective to ignore seasonal differences in patterns of water contact recreational uses. Criteria should be less stringent in the winter.

- That the criteria established by the Board are set at an overly conservative level, out-of-line with the levels established in neighboring states.

- That by using overly protective criteria, Tennessee assigns impairment status to a greater percentage of its streams than do other states, thus "packing" the 303(d) List.

- That recently developed techniques in DNA typing should be used to document whether a pathogen source is of human, livestock, or "natural background" origins, either before 303(d) Listing or during the TMDL process.

- That once assigned impaired status, streams will have little hope of being restored, as pathogen sources will be difficult to control, especially in urban settings.

The Division understands these concerns and has taken steps to address some of them. During the 1997 triennial review of water quality standards, we recommended that the Board adopt an additional pathogen criterion based on *E. coli* levels. (*E. coli* levels are generally accepted in the literature as being a better indicator of human risk than total fecal coliform.) The Board adopted an *E. coli* criterion of 126 cfu/100ml (as a geometric mean of multiple samples).

We do not at this time have a recommendation to forward to the Water Quality Control Board concerning possible additional revisions to pathogen criteria. As always, we are interested in what the public has to say on this subject. The comments we receive will be considered for the 2001 Triennial Review.

An improved pathogen standard would be one that provides a good indication of human health risk from disease transmission during water contact activities. It should also be generally protective of high-risk groups such as children, seniors, and those with suppressed immune systems.

Additionally, the test for the indicator must be relatively simple and inexpensive to run. Criteria for pollutants such as pathogens must be given, as appropriate, to NPDES dischargers as permit limits along with monitoring requirements. A new test, even if a better indicator, would be impractical if expensive. The indicators currently used, *E. coli* and total fecal coliform, are inexpensive and easy to replicate.

In making recommendations about use classifications, the public should be mindful that the Division is not free to recommend the removal of uses from streams without a proper site-specific basis for each.

Any proposal that seems to us to be an improvement over our current system of regulating pathogens that is also likely to be approved by EPA will be forwarded to the Board for consideration.

Literature Cited

Several Division publications provide insight into the scientific basis for proposed revisions. The documents listed below can be obtained from the Division. (These reports are not currently posted on our web site, but can be mailed.)

Arnwine, D. H., J.I. Broach, L.K. Cartwright, and G. M. Denton. 2000. Tennessee ecoregion project. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville TN. pp. 72, plus appendices.

Denton, G. M., D. H. Arnwine, and S. H. Wang. 2001. Development of regionally-based interpretations of Tennessee's narrative nutrient criterion. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville TN. pp. 57.

Arnwine, D. H. and G. M. Denton. 2001. Development of regionally-based numeric interpretations of Tennessee's narrative biological integrity criterion. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville TN. pp. 93, plus appendices.

Arnwine, D. H. and G. M. Denton. 2001. Habitat quality of least-impacted streams in Tennessee. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville TN. pp. 40, plus appendices.

Proposed General Revisions to Water Quality Standards

Chapter 1200-4-3-.02, General Considerations

Citation: 1200-4-3-.02 (8)

General Change: Addition of a statement describing how much of a stream must be within an ecoregion or subecoregion in order for regional criteria to appropriately apply. Following paragraphs would have to be renumbered.

Rationale: The regulation must be specific as to which streams will be covered by regional goals. The general wording would be similar to the following:

(8) Some general water quality criteria will be applied on a regional, ecoregional, or subecoregional basis. These criteria will be considered to apply to a stream if 80% of its watershed or catchment is contained within the unit upon which the criterion is based.

Chapter 1200-4-3-.03, Criteria for Water Uses

Citation: 1200-4-3-.03(1)(j)

General Change: Update criteria for domestic water supply protection.

Rationale: The existing arsenic criterion for drinking water (50 ug/L) has been revised by EPA. Additional criteria may also have been revised. The Division will propose updating these numbers to reflect these revisions. The Division's recommendation for revisions to these numeric criteria will be based on EPA's published national guidance at the time of the recommendation.

Citation: 1200-4-3-.03(3)(a)

General Change: Incorporate some regional dissolved oxygen (DO) goals.

Rationale: The existing fish and aquatic life protection criteria for dissolved oxygen levels have not been revised in many years. As currently written, the criteria suggest that the minimum acceptable dissolved oxygen levels in any stream is 5 mg/L, but notes that DO can go as low as 3 mg/L. We have learned from our work in reference streams that such wording is arguably underprotective in some regions of the state, but perhaps equally overprotective in others.

The Division intends to continue studying dissolved oxygen levels at reference streams. Currently, our database consists of data collected during daylight hours. However, we also intend to study diurnal DO patterns. (We already have some of these type data.)

Following these investigations, which will be published, we will propose revisions to the DO criteria for fish and aquatic life protection. We anticipate that we will propose a multi-tiered approach. Generally, these tiers might be something similar to the following:

- Regions in which the existing DO standard of 5 mg/L is overly protective. The DO criterion in these regions would be proposed at 3 mg/L.

- Regions in which the criteria would be allowed to fluctuate below 5 mg/L, but with stipulations. These stipulations would limit the frequency, magnitude, and duration of excursions below 5 mg/L. The magnitude of diurnal swings (fluctuation within a 24-hour period) might also be limited. DO levels below 3 mg/L would not be allowed.

- Regions in which DO levels should not fall below 5 mg/L at any time.

- Regions in which the existing DO criteria is underprotective. A higher criteria would be proposed in these regions.

(Note to the reader: in the above descriptions, the word “regions” is used uniformly. However, the reader should not infer that multiple ecoregions or subregions are represented with each tier above.)

Citation: 1200-4-3-.03(3)(b)

General Change: Incorporate some regional pH goals.

Rationale: As with dissolved oxygen levels, we have learned from our work in reference streams that in some areas of the state, pH levels can violate the statewide water quality for pH (range between 6.5 and 9) without an apparent effect on the biological community. It is thought that in these areas, the aquatic life has adapted to naturally low pH levels.

These studies indicate that regional pH criteria could be scientifically defensible and would be more appropriate than the existing statewide criteria. In most regions of the state, the existing pH criteria would remain in effect. However, in some regions, the lower pH range will be proposed at either 6.0 or 5.5, instead of the existing 6.5.

The Division intends to publish an analysis of pH levels at reference streams. This document will provide the scientific basis for the eventual recommendation.

Citation: 1200-4-3-.03(3)(g)

General Change: Update toxic substances criteria for fish and aquatic life protection.

Rationale: EPA may have revised the national guidance for some of the listed substances. The Division's recommendation for revisions to these numeric criteria will be based on EPA's published national guidance at the time of the recommendation.

Citation: 1200-4-3-.03(3)(i)

General Change: Create a more specific statewide narrative criteria for nutrients. Propose a set of regional numeric interpretations for total phosphorus and nitrate+nitrite. (Following paragraphs would have to be renumbered.)

Rationale: The Division has been studying nutrient levels at reference streams across the state and has proposed that the 90th percentile of the reference condition for total phosphorus and nitrate+nitrite be used as a regional goal for these substances. The Division will also recommend that these criteria stipulate that violations of the nutrient criteria should not be used to assess the stream as impacted if the aquatic community of the stream can be demonstrated to meet Tennessee's biological integrity goals. Additionally, the proposed criteria will be designed in such a way that it is clear that the goals do not apply to lakes, wetlands, and large streams not substantially within the region upon which the criterion is based.

For more information about the scientific basis for this proposal, the Division's nutrient criteria development document is recommended and is available upon request. (See list on page 6 for citation.) Pages 49 and 50 of the report establish the 90th percentiles for each region at the time the report was published. However, the reader should note that the Division has continued to collect data at reference streams and the final recommendation will contain these additional data.

The new, more specific statewide narrative nutrient criteria might read something like this:

(i) Nutrients – The waters shall not contain nutrients in concentrations that stimulate aquatic plant and/or algae growth to the extent that aquatic habitat is substantially reduced and/or the biological integrity fails to meet regional goals. Additionally, the quality of downstream waters shall not be detrimentally effected.

Citation: 1200-4-3-.03(3)(j)

General Change: Propose a set of regional numeric interpretations for the existing narrative biological integrity criterion.

Rationale: The Division has been studying biological communities at reference streams across the state and has proposed both a methodology and system of measurement for applying the existing narrative criterion on a regional basis. Briefly, the Division has proposed a stream quality index based on a combination of commonly-used biological indices. A test stream's cumulative score for each index will be compared to the same set of scores at the reference streams. Test streams within 75 percent of the 90^{th} (or 10^{th}) percentile of the reference stream scores will be considered to meet the biological integrity standard for that region.

Additionally, the proposed criteria will clearly state that the goals do not apply to lakes, wetlands, and large streams not substantially within the region upon which the criterion is based.

For more information about the scientific basis for this proposal, the Division's biocriteria development document is recommended and is available upon request. (See list on page 6 for citation.) Pages 65 through 72 of the report establish the composition of the "bioregions" and identify the cumulative scores that provide the reference goal for each region at the time the report was published. However, the reader should note that the Division has continued to collect data at reference streams and the final recommendation will contain these additional data.

Citation: 1200-4-3-.03(3)(k)

General Change: Propose a narrative instream habitat criterion

Rationale: The Division has been studying the instream habitat quality of reference streams across the state and has proposed methodologies for consistent measurement and comparison. The proposed criterion might generally state:

(k) The quality of instream habitat shall provide for the development of a diverse aquatic community that meets regionally-based biological integrity goals. The instream habitat within each subecorgion shall be generally similar to that found at reference streams. However, streams should not be assessed as impacted by habitat loss if it has been demonstrated that the biological integrity goal has been met.

Additionally, it should be noted that habitat quality is subecoregion specific since a spot on a stream, rather than an entire stream, is being compared to the reference condition. Thus, unlike proposed nutrient or biological integrity goals, a stream does not have to be substantially contained within a single subecoregion in order for the habitat goal to apply. All that is required is that the spot being evaluated is in the same subecoregion as the reference condition being used for comparison.

For more information about the scientific basis for this proposal, the Division's habitat guidance development document is recommended and is available upon request. (See list on page 6 for citation.)

Citation: 1200-4-3-.03(4)(d)

General Change: Clarify the existing narrative recreational criteria for turbidity and color.

Rationale: A second sentence will be added. *Streams substantially contained within an ecoregion will be expected to have color and/or turbidity levels not significantly higher than the established reference condition for that region.*

Citation: 1200-4-3-.03(4)(h)

General Change: Update toxic substances criteria for protection of recreational uses.

Rationale: EPA may have revised the national guidance for some of the listed substances. The Division's recommendation for revisions to these numeric criteria will be based on EPA's published national guidance at the time of the recommendation.

Citation: 1200-4-3-.03(4)(j)

General Change: Add a narrative recreational criteria for nutrients.

Rationale: The new criteria would read something like this.

(j) Nutrients – The waters shall not contain nutrients in concentrations that stimulate aquatic plant and/or algae growth to the extent that the public's recreational uses of the stream or other downstream waters is detrimentally effected. Unless demonstrated otherwise, the nutrient criteria found in 1200-4-3-.03(3)(i) will be considered adequately protective of this use.

Chapter 1200-4-3-.04, Definitions

Citation: 1200-4-3-.04(7)

General Change: Add definition of “subecoregion.” Following definitions would have to be renumbered.

Rationale: This term is used in the general water quality criteria and may not be widely understand. The definition would read something like this:

(8) Subecoregion – a smaller area that has been delineated within an ecoregion that has even more homogeneous characteristics than does the original ecoregion.

Citation: 1200-4-3-.04(9)

General Change: Add definition of “reference condition.” Following definitions would have to be renumbered.

Rationale: This term is used in the general water quality criteria and may not be widely understand. The definition would read something like this:

(8) Reference condition – a parameter-specific set of data from reference sites within a region that establish the range of observations for that substance in least-impacted streams.

Chapter 1200-4-3-.05, Interpretation of Criteria

Citation: 1200-4-3-.05(4)

General Change: Create an exception for the flow basis for application of the nutrient criteria.

Rationale: As recommended in the Division’s study of nutrient levels in reference streams, the 7Q10 flow is not considered appropriate for application of nutrient criteria as the regulation of these substances is not strictly on the basis of a toxic effect. The existing first sentence would be rewritten as follows:

With the exception of nutrient criteria [(1200-4-3-.03(3)(i)], the fish and aquatic life and livestock watering and wildlife criteria…

Citation: 1200-4-3-.05(4)

General Change: Change the flow basis for applying recreation and nutrient criteria.

Rationale: During the 1997 Triennial Review of Water Quality Standards, the flow basis for applying fish and aquatic life was revised from a 3Q20 to a 7Q10 low flow. The basis for that revision was to follow EPA's published guidance on that subject, which is contained in the 1991 EPA document entitled *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001).

Using the same logic, Tennessee's flow basis for recreational criteria also needs to follow EPA guidance. The criteria currently stipulate a 30Q2 flow basis. The EPA recommended flow basis is 30Q5 (page 69, EPA/505/2-90-001). The last sentence in 1200-4-3-.05(4) should be revised so that it reads "5 year recurrence" rather than "2 year recurrence."

Citation: 1200-4-3-.05(8)

General Change: Update list of required detection levels.

Rationale: EPA may have revised the national guidance for some of the listed substances. The Division's recommendation for revisions to these values will be based on EPA's published national guidance at the time of the recommendation.

Chapter 1200-4-3-.06, Tennessee Antidegradation Statement

Citation: 1200-4-3-.06 (1)

General Change: Add a requirement that alternatives analysis must take place before new or expanded discharges can be allowed in Tier I waters.

Rationale: EPA has informed the Division that alternatives analysis must take place before any new or expanded discharges are allowed, even in Tier I waters. The Division has been informally (as policy) requiring alternatives analysis in these situations. However, these policies need to be formalized into the regulation.

The recommended addition would read something like this:

New or expanded discharges to Tier I waters cannot be allowed unless an alternatives analysis has been completed by the applicant that indicates that no feasible alternative to the new or expanded discharge exists. For discharges, alternatives to be evaluated include, but are not limited to, land application, connection to an existing system, recycling or reuse of effluents. The evaluation should include a discussion of the feasibility, economic costs, and environmental consequences of each potential alternative.

Citation: 1200-4-3-.06 (3)

General Change: Consider the recommendation of additional Outstanding National Resource Waters (ONRWs).

Rationale: During the 1997 triennial review, the Board designated seven new ONRWs. Additionally, the Board added to the regulation a set of requirements for future candidates for ONRW status. One of these requirements was that a candidate ONRW should have a cost/benefit study completed before full consideration before the Board.

The Department has funded two ONRW cost/benefit studies thus far, both for streams in Monroe County. The University of Tennessee found in a scientific study that the economic benefits (primarily tourism) of designating portions of the Tellico River and Citico Creek as ONRWs would significantly outweigh the costs associated with the regulatory requirements.

The Division is not prepared to indicate at this time whether or not we intend to recommend the Tellico River or Citico Creek as ONRWs. If we chose to do so, we will follow the procedure established by the Board for such nominations. However, it should be noted that the public is free to approach the Board with any ONRW recommendations, regardless of the position taken by the Division on these Monroe County streams.

Proposed General Revisions to Water Quality Standards

Chapter 1200-4-4, Use Classifications for Surface Waters

General Revisions - The Division will suggest revisions to the list of trout streams and naturally reproducing trout streams under this regulation. The primary source of information for these suggestions will be recommendations from staff of the Tennessee Wildlife Resources Agency.

Specific Revisions:

Citation: 1200-4-4-.01

General Change: Move Cypress Creek from unnamed status under the “catch-all phrase” to named status. Existing designated uses (fish and aquatic life, recreation, irrigation, livestock and wildlife watering) would remain unchanged.

Rationale: Cypress Creek is a tributary of the Wolf River in Memphis that historically has been subjected to a substantial amount of alteration. Cypress Creek is clearly a stream as it does not meet the definition of a wet weather conveyance found in the regulation [1200-4-3-.04(4)]. As an unnamed stream in the Memphis Basin, it is classified under the "catch-all phrase" for the uses of fish and aquatic life, recreation, irrigation, and livestock and wildlife watering.

The Division is proposing this change in the hope that it will eliminate local confusion about the status of this stream under the regulation. It is important for the reviewer to note that the Division is not recommending that the use classifications of this stream be changed.

Citation: 1200-4-4-.06

General Change: Change the description of one of the segments of Shoal Creek.

Rationale: The description of the first segment of Shoal Creek currently reads "Tenn-Ala State Line (mile 20.6) to Origin." This description is incorrect and should instead read "Tenn-Ala State Line (mile 20.6) to mile 56.9." A different listed segment begins at mile 56.9 and continues upstream.

Citation: 1200-4-4-.10

General Change: Move the downstream segment of Dry Creek in Greene County (mouth to mile 1.3) from unnamed status under the "catch-all phrase" to named status. Existing designated uses (fish and aquatic life, recreation, irrigation, livestock and wildlife watering) would remain unchanged.

Rationale: Dry Creek is a tributary of Camp Creek (which is a tributary to the Nolichucky River). The upstream portion of the stream is identified as a naturally reproducing trout stream. The downstream section of the stream has been subjected to a substantial amount of historical alteration. Dry Creek is clearly a stream as it does not meet the definition of a wet weather conveyance found in the regulation [1200-4-3-.04(4)]. As an unnamed stream in the French Broad Basin, it is classified under the "catch-all phrase" for the uses of fish and aquatic life, recreation, irrigation, and livestock and wildlife watering.

The Division is proposing this change in the hope that it will eliminate local confusion about the status of this stream under the regulation. The Division is not recommending that the use classifications of this stream be changed.